SECTION 5 CONTENTS

WATER SUPPLY AND USE

Salt Lake County is the most densely populated county in the state and relies heavily on groundwater and surface water sources within the valley as well as imported water to meet the growing demand.

5.1 Introduction

This section discusses historical flows, developed water supplies and present water use in the Jordan River Basin. Essentially all of the surface and groundwater sources are fully appropriated and developed. There is, however, a decreasing need for irrigation water and an increasing need for municipal and industrial water. As irrigated lands have gone out of production, the highest quality irrigation supplies have been converted to municipal and industrial uses. Irrigation water supplies that remain are poor quality and will require expensive treatment processes to be converted to M&I uses.

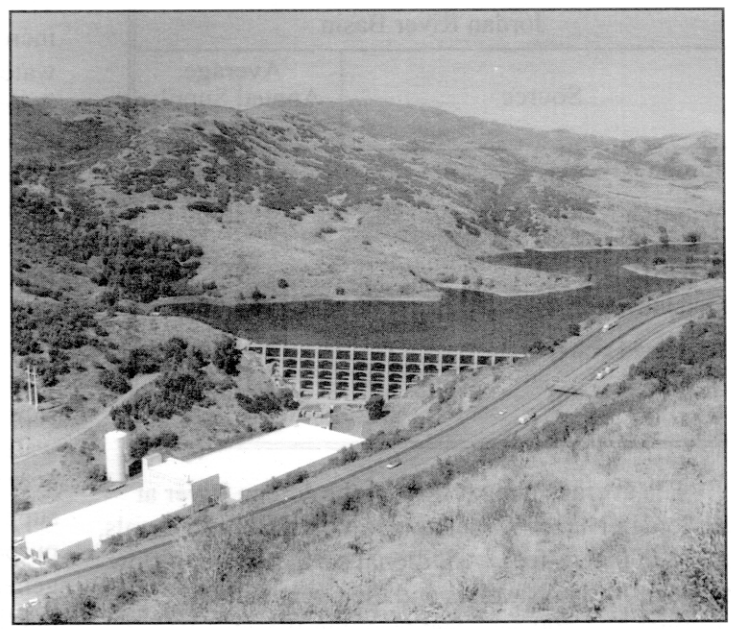
Imported water is playing an increasingly important role. The Metropolitan Water District of Salt Lake City (MWD) and the Salt Lake County Water Conservancy District (SLCWCD) import water from neighboring counties to the south and east to meet the municipal and industrial demands in the basin.

5.2 Background

From the time settlers first came into Salt Lake Valley and diverted local streams onto the land to irrigate their crops, organizations and agencies were established to develop and manage water. Now, nearly 150 years later, a large number of water organizations have evolved which hold water rights, serve a group of users or customers and have a stake in any future water development. These entities represent overlapping and layered jurisdictions which must be considered and incorporated into the water planning process.

Rapid population and economic growth along the Wasatch Front (from Provo on the south to Ogden on the north) is putting considerable pressure on the limited water resources of the region. This heavily urbanized area, roughly 100 miles long and from 10 to 20 miles wide, supports over 75 percent of the approximate two million residents of the state.

Within the Jordan River Basin, surface water supplies are already largely developed and water is being imported from outside the basin. A substantial amount of groundwater is also being develop. The Salt Lake Valley groundwater basin is considered over-appropriated, but not yet over-developed.



Mt. Dell Reservoir

Water agency planners and managers recognize that additional water supplies will undoubtedly be needed at some point in the future. There is some uncertainty as to what extent conservation and recycling measures may delay the development of new water sources, and whether or not arrangements among existing water rights holders can be made to improve the efficient use of existing supplies.

5.3 Water Supply

The Jordan River Basin's present water supplies come from three categories: groundwater, local surface water and imported surface water. An estimate of the total present water supply for the Jordan River Basin is presented in Table 5-1. Imported water, as shown in Table 5-2, includes deliveries directly by pipeline from Deer Creek Reservoir, Central Utah Project (Bonneville Unit) deliveries from Jordanelle Reservoir, and Welby-Jacob Exchange water from Provo and Weber rivers and Echo Reservoir and industrial supplies from Tooele County.

Table 5-1
TOTAL WATER SUPPLY
Jordan River Basin

Source	Average Annual Supply (acre-feet)
Jordan River	308,000
Wasatch Mountain streams	173,400
Oquirrh Mountain streams	4,400
Groundwater	168,500
Imported water	170,700
Total	825,000

The average annual flow of the Jordan River at the Jordan Narrows, including all diversions to canals, is 308,000 acre-feet. Additional surface water inflow between Jordan Narrows and the Great Salt Lake averages 173,400 acre-feet from the Wasatch Range mountain stream and 4,400 acre-feet from Oquirrh Mountain streams.

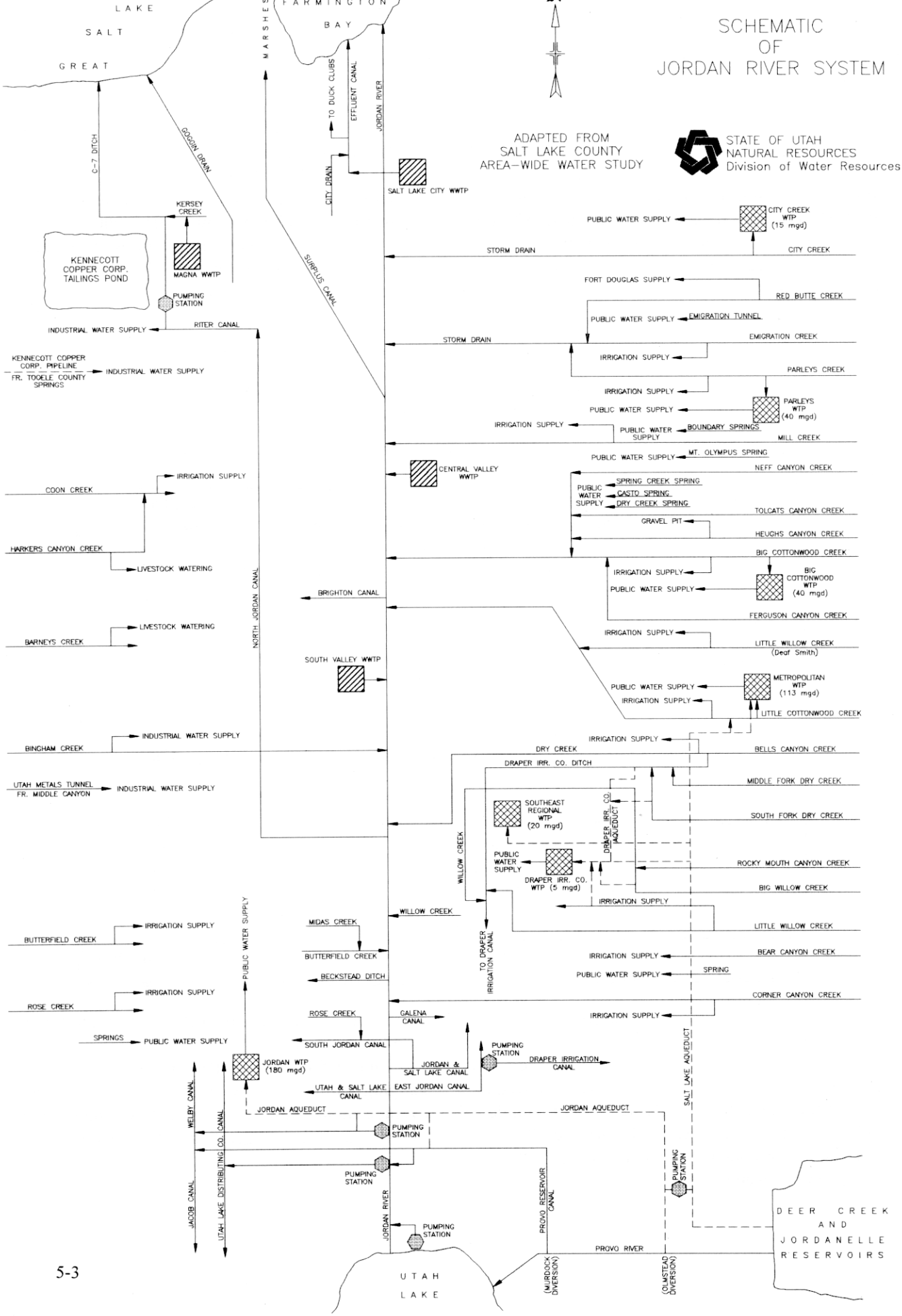
Figure 5-1 is a schematic of the Jordan River system. The horizontal line across the center of the page represents the Jordan River flowing from Utah Lake on the left to the Great Salt Lake on the right. Tributary flows from the Wasatch Range streams are represented by the vertical lines along the bottom of the figure. Irrigation withdrawals and culinary diversions for water treatment are shown. Despite irrigation and culinary withdrawals, the Wasatch Range streams are all shown as terminating at the Jordan River. On the other hand, the Oquirrh Mountain streams, except for Bingham Creek, are depicted as terminating short of the Jordan River (See the upper center of Figure 5-1). Because of the intermittent and ephemeral nature of these streams for much of the year, surface water flows often do not reach the Jordan River.

Water storage in Deer Creek and Jordanelle reservoirs is represented in the lower left hand corner of Figure 5-1. Water can be released from Deer Creek Reservoir to either the Provo River or the Salt Lake Aqueduct. The Salt Lake Aqueduct flow can be delivered to the Metropolitan Water Treatment Plant, the Southeast Regional Treatment Plant, the Draper Irrigation Company Treatment Plant, or diverted to the Jordan Aqueduct and conveyed to the Jordan Valley Water Treatment Plant. At the Olmsted Diversion, Provo River water can be diverted to the Jordan Aqueduct and conveyed to Jordan Valley Treatment Plant. A pump station gives the system increased flexibility, making it possible to pump water from the Jordan Aqueduct to the Salt Lake Aqueduct. Diversions from the Jordan River to various irrigation canals are shown. The figure also gives the location of the valley's water and wastewater treatment plants. Presently developed water supplies are summarized in Table 5-2 and discussed in the following subsections.

The valley's presently developed water supply is summarized by source in Table 5-3. The developed water is segregated into two parts: The public water supply is shown first, and the privately developed water supply second. For the public water supply, the average annual supply is given as well as the reliable supply for nine out of 10 years. For planning purposes the reliable supply for nine out of 10 years is generally accepted as the firm yield. The basin's public water supply comes primarily from nine sources: City Creek, Parley's Creek, Big Cottonwood Creek, Little Cottonwood Creek, other small mountain streams, Welby-Jacob Exchange, Central Utah Project, Deer Creek Reservoir and groundwater. Shown second in the table are the privately developed water supplies including private domestic wells, stockwatering wells, irrigation water and industrial water.

5.3.1 Surface Water

Surface water sources include flows from Wasatch Front mountain streams, Oquirrh Mountain streams and the Jordan River. Inflow to the Jordan River from Utah Lake averages 308,000 acre-feet.


SCHEMATIC
OF
JORDAN RIVER SYSTEM
ADAPTED FROM
SALT LAKE COUNTY
AREA-WIDE WATER STUDY
STATE OF UTAH
NATURAL RESOURCES
Division of Water Resources
GREAT
SALT
LAKE
FARMINGTON
BAY
MARSHES
TO DUCK CLUBS
EFFLUENT CANAL
JORDAN RIVER
CITY DRAIN
SALT LAKE CITY WWTP
C-7 DITCH
GODDIN DRAIN
KERSEY
CREEK
KENNECOTT
COPPER CORP.
TAILINGS POND
MAGNA WWTP
PUMPING
STATION
INDUSTRIAL WATER SUPPLY
RITER CANAL
SURPLUS CANAL
KENNECOTT COPPER
CORP. PIPELINE
FR. TOOELE COUNTY
SPRINGS
INDUSTRIAL WATER SUPPLY
PUBLIC WATER SUPPLY
CITY CREEK
WTP
(15 mgd)
STORM DRAIN
CITY CREEK
FORT DOUGLAS SUPPLY
RED BUTTE CREEK
PUBLIC WATER SUPPLY
EMIGRATION TUNNEL
STORM DRAIN
EMIGRATION CREEK
IRRIGATION SUPPLY
PARLEYS CREEK
IRRIGATION SUPPLY
PUBLIC WATER SUPPLY
PARLEYS
WTP
(40 mgd)
IRRIGATION SUPPLY
PUBLIC WATER
SUPPLY
BOUNDARY SPRINGS
MILL CREEK
PUBLIC WATER SUPPLY
MT. OLYMPUS SPRING
CENTRAL VALLEY
WWTP
NEFF CANYON CREEK
PUBLIC
WATER
SUPPLY
SPRING CREEK SPRING
CASTO SPRING
DRY CREEK SPRING
TOLCATS CANYON CREEK
GRAVEL PIT
HEUGHS CANYON CREEK
BIG COTTONWOOD CREEK
IRRIGATION SUPPLY
PUBLIC WATER SUPPLY
BIG
COTTONWOOD
WTP
(40 mgd)
FERGUSON CANYON CREEK
IRRIGATION SUPPLY
LITTLE WILLOW CREEK
(Deaf Smith)
PUBLIC WATER SUPPLY
METROPOLITAN
WTP
(113 mgd)
IRRIGATION SUPPLY
LITTLE COTTONWOOD CREEK
IRRIGATION SUPPLY
BELLS CANYON CREEK
DRY CREEK
DRAPER IRR. CO. DITCH
MIDDLE FORK DRY CREEK
SOUTHEAST
REGIONAL
WTP
(20 mgd)
DRAPER IRR. CO.
AQUEDUCT
SOUTH FORK DRY CREEK
PUBLIC
WATER
SUPPLY
DRAPER IRR. CO.
WTP (5 mgd)
WILLOW CREEK
ROCKY MOUTH CANYON CREEK
BIG WILLOW CREEK
IRRIGATION SUPPLY
LITTLE WILLOW CREEK
BEAR CANYON CREEK
IRRIGATION SUPPLY
PUBLIC WATER SUPPLY
SPRING
CORNER CANYON CREEK
IRRIGATION SUPPLY
GALENA
CANAL
ROSE CREEK
SOUTH JORDAN CANAL
PUMPING
STATION
DRAPER IRRIGATION
CANAL
JORDAN &
SALT LAKE CANAL
EAST JORDAN CANAL
UTAH & SALT LAKE
CANAL
JORDAN WTP
(180 mgd)
SALT LAKE AQUEDUCT
JORDAN AQUEDUCT
JORDAN AQUEDUCT
PUMPING
STATION
PUMPING
STATION
PUMPING
STATION
PUMPING
STATION
WELBY CANAL
UTAH LAKE DISTRIBUTING CO. CANAL
JACOB CANAL
JORDAN RIVER
PROVO RESERVOIR
CANAL
PROVO RIVER
(MURDOCK
DIVERSION)
(OLMSTEAD
DIVERSION)
DEER CREEK
AND
JORDANELLE
RESERVOIRS
UTAH
LAKE
NORTH JORDAN CANAL
BRIGHTON CANAL
SOUTH VALLEY WWTP
COON CREEK
IRRIGATION SUPPLY
HARKERS CANYON CREEK
LIVESTOCK WATERING
BARNEYS CREEK
LIVESTOCK WATERING
BINGHAM CREEK
INDUSTRIAL WATER SUPPLY
UTAH METALS TUNNEL
FR. MIDDLE CANYON
INDUSTRIAL WATER SUPPLY
BUTTERFIELD CREEK
IRRIGATION SUPPLY
ROSE CREEK
IRRIGATION SUPPLY
SPRINGS
PUBLIC WATER SUPPLY
PUBLIC WATER SUPPLY
MIDAS CREEK
BUTTERFIELD CREEK
BECKSTEAD DITCH
WILLOW CREEK
TO DRAPER
IRRIGATION CANAL

The average annual stream flow from the Wasatch Range is 173,400 acre-feet. The Oquirrh Mountain streams average only 4,400 acre-feet. See Table 5-4 for a detailed breakdown of these figures. The average annual flows in Table 5-4 for the Wasatch Range mountain streams and Oquirrh Mountain streams is taken from the *Salt Lake County Area-Wide Water Study*, published in 1982, and reflect data through 1981. Flows for the ungaged streams were estimated through comparison with gaged streams by use of the area-altitude-precipitation method.

The U.S. Geological Survey (USGS) currently maintains five streamflow gauging stations in the Jordan River Basin. In addition to the existing USGS stations, in the past stations have been located on the Jordan River and tributary streams. Although no longer in use, these discontinued stations are a valuable source of streamflow data. One station was located in the Jordan Narrows (10167000) downstream of the diversion structures for the East Jordan Canal and the Utah and Salt Lake Canal. This station, although discontinued in 1990, collected more than 75 years of streamflow data at the Jordan Narrows location.

Table 5-2
PRESENTLY DEVELOPED WATER SUPPLIES
Jordan River Basin

Source	Description	Average Annual (ac-ft/yr)
Surface Water	Irrigation	140,000
	Public supply - Wasatch Range streams	68,190
	Supply to wet/open areas	94,500
	Secondary	10,000
	Private industrial	3,200
	Subtotal	315,890
Groundwater	Public supply wells and springs	114,400
	Private domestic	24,600
	Self-supplied industrial	26,500
	Irrigation wells	3,000
	Artificial groundwater recharge	5,800
	Subtotal	174,300
Imported Water	Tooele County	10,000
	Deer Creek Reservoir	61,700
	Central Utah Project	70,000
	Welby-Jacob Exchange	29,400
	Subtotal	171,100
	Basin Total	661,290

Historically, surface water sources were first developed for irrigation, while groundwater provided for domestic and culinary needs. With the increasing population, a series of exchanges were employed to convert the highest quality surface water to municipal and industrial use. Consequently, Wasatch Range streams now provide an annual average 68,190 acre-feet for public water supplies.

Table 5-5 lists the past and present basin stream gauging stations along with the years of record and average annual flow. Figure 5-2 shows the location of the existing USGS gauging stations and the discontinued stations.

Table 5-3
EXISTING WATER SUPPLY (PUBLIC AND PRIVATE) - 1995
Jordan River Basin

PUBLIC WATER SUPPLY (ac-ft/yr)
(includes residential, commercial and industrial uses)

Source	Average Supply	Reliable Supply (90% probability)
Wasatch Range streams		
City Creek	8,310	6,080
Parley's Creek	8,890	5,210
Big Cottonwood Creek	25,920	20,020
Little Cottonwood Creek	21,670	17,340
Small mountain streams	3,400	1,100
Subtotal	68,190	49,750
Welby-Jacob Exchange	29,400	17,500
Central Utah Project	70,000	84,000 [b]
Deer Creek Reservoir	61,700	61,700
Groundwater	114,400	114,400
Artificial groundwater recharge	5,800	1,060
TOTAL	349,490	328,410

PRIVATELY DEVELOPED WATER SUPPLIES

Use	Description	Supply (ac-ft/yr)	
		Annual average	Subtotal
Private	Private domestic and stock wells	24,600	24,600
Self-supplied Industrial	Industrial wells	26,500	39,700
	Imported from Tooele County	10,000	
	Surface and springs	3,200	
Agricultural	Irrigation (primarily from Jordan River)	140,000	143,000
	Irrigation wells	3,000	
Secondary	Lawns and gardens	10,000	10,000
Environmental	Developed wetlands and open water areas	94,500	94,500
TOTAL			311,800

(a) Streamflow values are from the *Salt Lake County Area-Wide Study* and reflect 1940-1980 base time period.
(b) The Central Utah Project is managed to bring up to 84,000 acre-feet of water into the basin during times of drought.

The Jordan River has an average annual flow of about 308,000 acre-feet at the Jordan Narrows. As can be seen from Figure 5-3, that amount includes the extremely wet years of 1983 through 1986. A close examination of Figure 5-3 and Figure 5-4 reveals that the flow of the Jordan River can drop below 200,000 acre-feet per year for an extended period of time, as was the case in the early 1930s and 1960s. In recent years, over 90,000 acre-feet of water rights in Utah Lake have been purchased for securing the storage right for Jordanelle Reservoir. In addition, over 40,000 acre-feet of water rights have been purchased by the Salt Lake County Water Conservancy District for the Welby-Jacob Exchange. Of the sources available, it is estimated that the surface water supply presently developed for irrigation in Jordan River Basin is about 140,000 acre-feet per year. This amount is consistent with the most recently completed landuse survey for the valley. For more information on this topic see Section 10, Agricultural Water.

5.3.2 Groundwater

Groundwater is an important source of water supply in the Jordan River Basin. The current total groundwater supply is estimated to be 174,300 acre-feet per year. This includes all sources including public drinking water supplies (114,400 acre-feet), private domestic and stock watering wells (24,600 acre-feet), private agricultural wells (3,000 acre-feet), privately developed industrial wells (26,500 acre-feet) and 5,800 acre-feet of artificial groundwater recharge. Existing developed groundwater sources for each public water supplier are tabulated in Table 5-6. Current groundwater withdrawals (1986-1995) are

estimated to be around 134,500 acre-feet per year.

An estimated 145,800 acre-feet of the present 174,300 acre-feet of existing groundwater supply is suitable for culinary use without treatment. The remaining 28,500 acre-feet is of lesser quality (high salinity, i.e., high total dissolved solids) and suitable for culinary use only after treatment to lower the salinity or after blending with higher quality water. Water quality is discussed in more detail in Section 12, Water Quality and Section 19, Groundwater.

Table 5-4
MOUNTAIN STREAMS - ANNUAL FLOW
Jordan River Basin

Wasatch Range Streams	(acre-feet)
City	11,750
Red Butte	2,450
Emigration	4,440
Parley's	18,130
Mill	10,760
Neffs	4,280
Tolcats	650
Heughs	1,770
Big Cottonwood	51,240
Ferguson	1,450
Deaf Smith	4,520
Little Cottonwood	46,190
Bells	6,280
Middle Fork Dry	700
South Fork Dry	1,360
Rocky Mouth	910
Big Willow	2,080
Little Willow	1,660
Bear	1,260
Corner	1,520
Total	173,400
Oquirrh Mountain Streams	
Rose	540
Butterfield	820
Bingham	1,450
Barneys	330
Harkers	470
Coon	790
Total	4,400

Source: *Salt Lake County Area-wide Water Study, 1982* (base time period is 1940-1980)

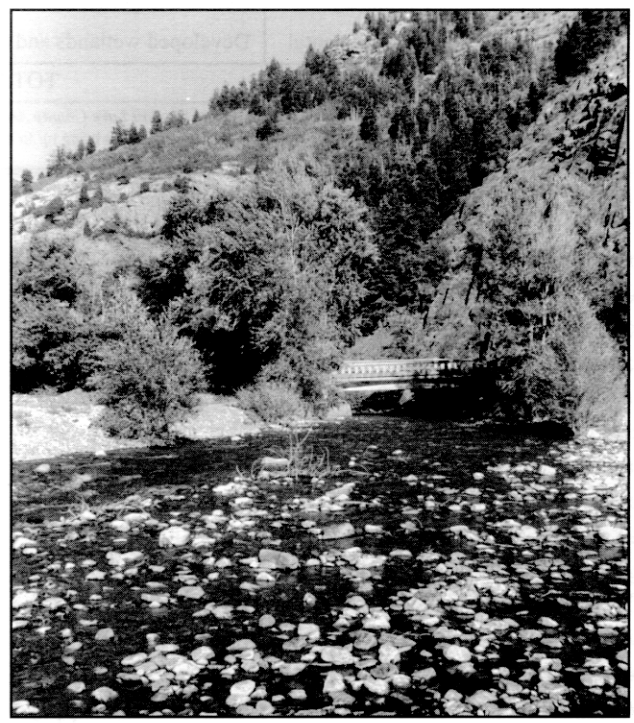
Plans are now in place to increase public water supplies from groundwater sources from 114,400 acre-feet to 125,410 acre-feet. These development plans are discussed in more detail in Section 9, Water Planning and Development. But restrictions are currently imposed by the State Engineer on applications to appropriate new groundwater. These restrictions,discussed in greater detail in Section 19, Groundwater, essentially close the county to new groundwater applications.

5.3.3 Imported Water

Salt Lake City can import as much as 61,700 acre-feet of water from the upper basin. This water is delivered from Deer Creek Reservoir through the Salt Lake Aqueduct and conveyed primarily to the MWD water treatment plant.

The Central Utah Project (CUP) currently delivers 20,000 acre-feet of municipal and industrial water to the Jordan River Basin. With the completion of Jordanelle Reservoir and other Central Utah Project elements, the CUP is now capable of delivering an annual average of 70,000 acre-feet. The Central Utah Project will be managed, however, to bring up to 84,000 acre-feet into the basin during times of drought.

The Welby-Jacob Exchange of Utah Lake water for higher quality Provo River water provides an average annual supply of 29,400 acre-feet. The



Big Cottonwood Creek

Table 5-5
STREAMFLOW GAGING STATIONS
Jordan River Basin

Number	Description	Years of record	Average Annual Flow
Gaging Stations on the main stem of the Jordan River:		(acre-feet)	
10167000	Jordan River at Narrows	1914 to 1989	295,200
10170500	Jordan River Surplus Canal	1942 to present	268,800
10171000	Jordan River (Below the Surplus Canal)	1942 to present	105,500
10170490	Jordan River + Surplus Canal	1942 to present	374,300
Gaging Stations on Tributary Streams:			
10167499*	Little Cottonwood Creek	1981-1991	22,730
10167500*	Little Cottonwood Creek (near Salt Lake City)	1964-1968,1980	35,910
10168000*	Little Cottonwood Creek (at Jordan River)	1980-1991	39,870
10168300	Big Cottonwood Creek (Tail race at Stairs Plant)	1925 to present	40,430
10168500*	Big Cottonwood Creek (near Salt Lake City)	1931-1990	44,380
10170000*	Mill Creek	1964-1968,1980	9,190
10172000*	Emigration Canyon	1964-1968,1980 1981,1983,1985	6,110
10172200	Red Butte Creek (Above Red Butte Reservoir)	1963 to present	3,110
10172200*	Red Butte Creek (Below Red Butte Reservoir)	1980-1991	2,100
10172500*	City Creek - (near Salt Lake City)	1964-1968,1980	10,370

* Salt Lake City Gaging Station

estimated amount available with a reliability of nine out of 10 years, however, is only 17,500 acre-feet. In addition, an estimated 10,000 acre-feet per year is brought into Salt Lake County from Tooele County by Kennecott Utah Copper for self-supplied industrial use.

5.4 Present Water Use

Water use can be separated into two general categories: potable and non-potable. Potable water satisfies most municipal and industrial demands while non-potable water supplies irrigation to agricultural lands and some residential lawns and gardens (secondary) and wetland areas. The present water use for the Jordan River Basin, potable and non-potable, is compared with the existing water supply in Table 5-7.

Potable water is divided into three water supply categories: public water systems, private domestic systems and self-supplied industrial. Public water systems deliver water to cities, towns and subdivisions. They are regulated by the Division of Drinking Water (See Section 11). Private domestic systems are individual residences not served by any

Figure 5-2

STREAM GAGE STATIONS
Jordan River Basin/Salt Lake County

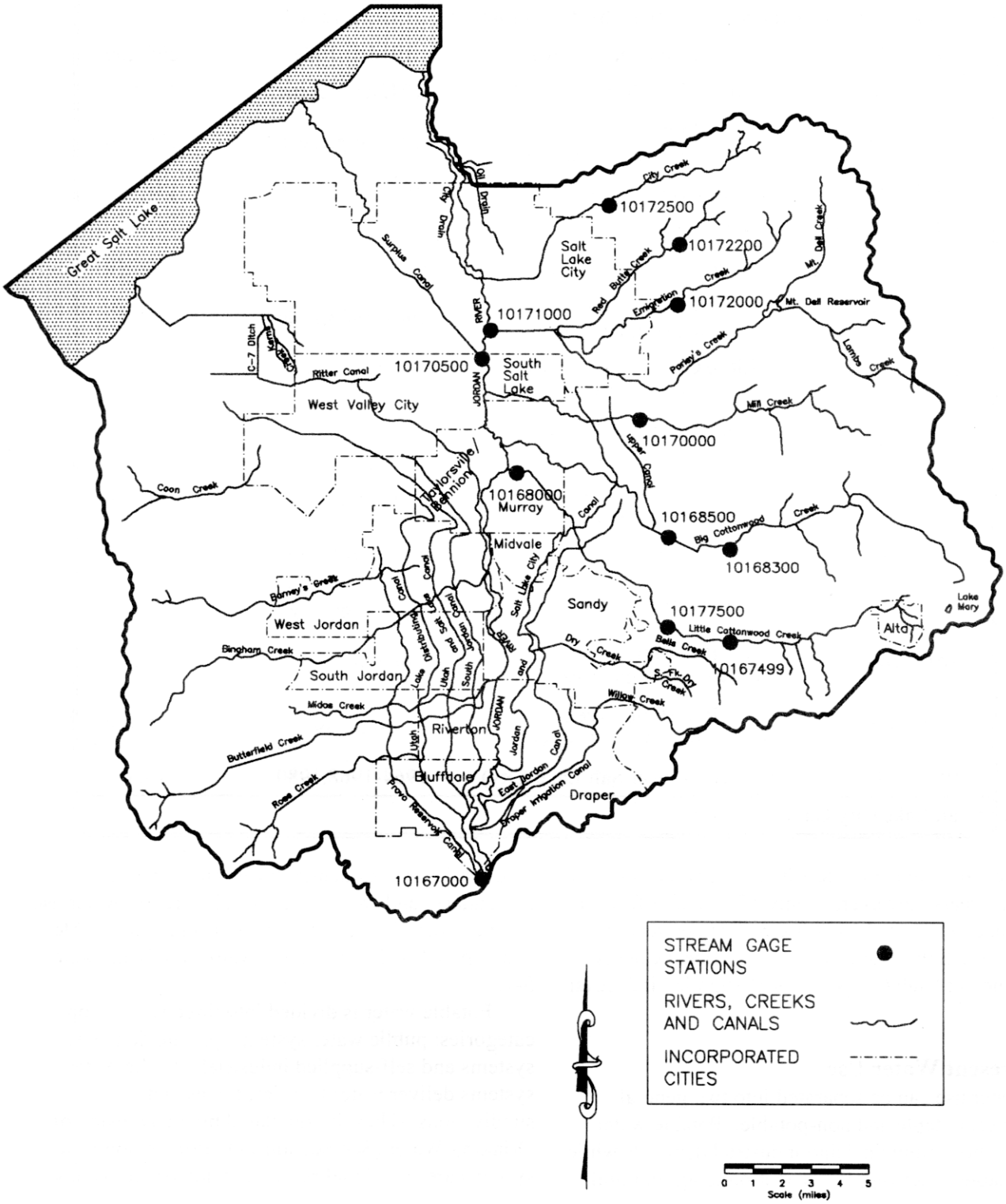


Figure 5-3
JORDAN RIVER AT NARROWS,
NEAR LEHI 1914-1990
(USGS 10167000)

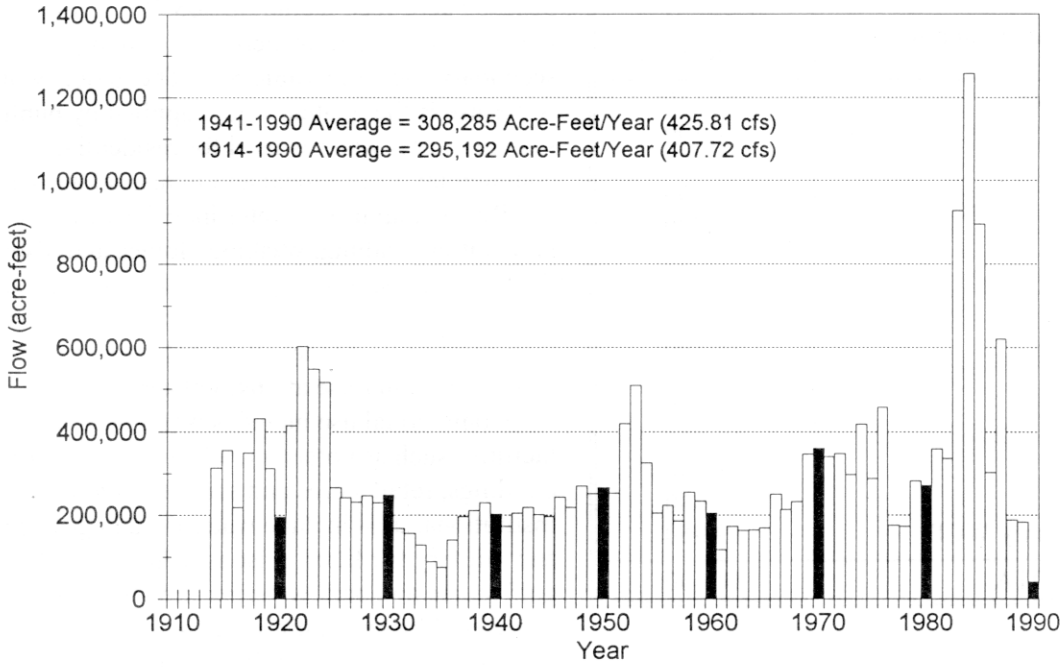


Figure 5-4
COMBINED FLOW JORDAN RIVER AND
SURPLUS CANAL 1944-1994 @ 21st SOUTH
(USGS 10170490)

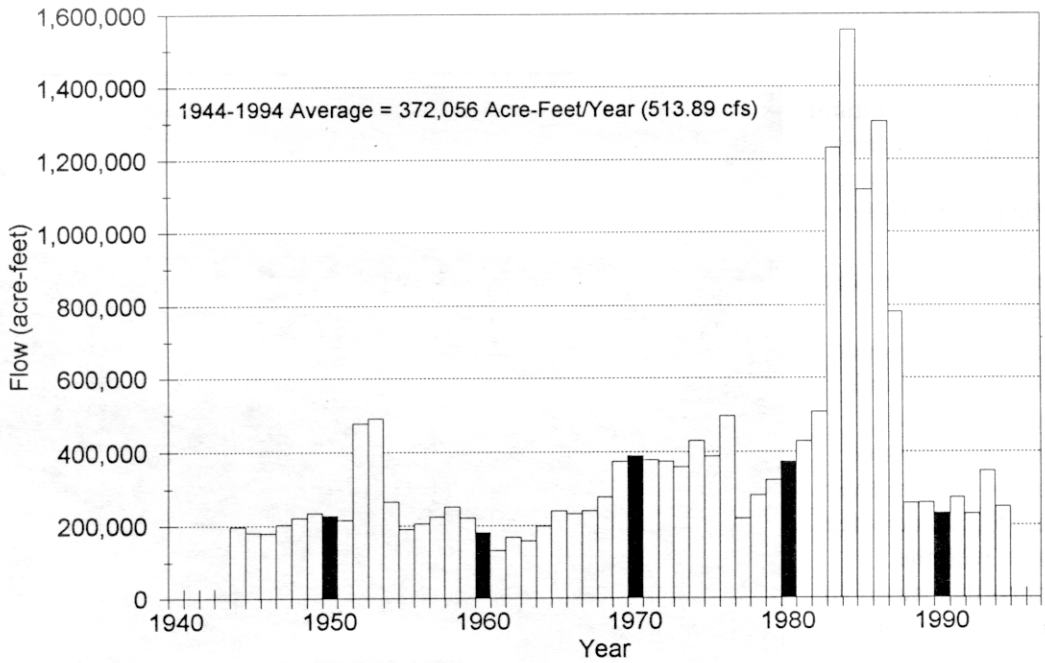


Table 5-6
PRESENTLY DEVELOPED PUBLIC GROUNDWATER SUPPLIES
Jordan River Basin

Public water supplier	Capacity (acre-feet/year)
Granger Hunter	7,340
Herriman	1,300
Holladay	3,520
Kearns	360
Magna	4,090
Midvale	740
Murray	11,590
Riverton	2,060
Salt Lake City	24,490
Sandy City	14,850
South Salt Lake	3,120
Taylorsville	12,700
West Jordan	5,650
White City	2,630
Salt Lake County WCD	19,960
TOTAL	114,400

public water system, and have their own wells. Similarly, self-supplied industrial users are industries not served by a public water system, but have their own private water source.

Non-potable water is divided into secondary, agricultural and developed wetlands water use categories. Secondary is non-potable water used for irrigation of residential lawns and gardens from either pressurized or ditch delivery systems. Agricultural is water used for irrigation of farm lands. Developed wetlands is water used to manage the private duck clubs and public water fowl management areas in the north west portion of the basin.

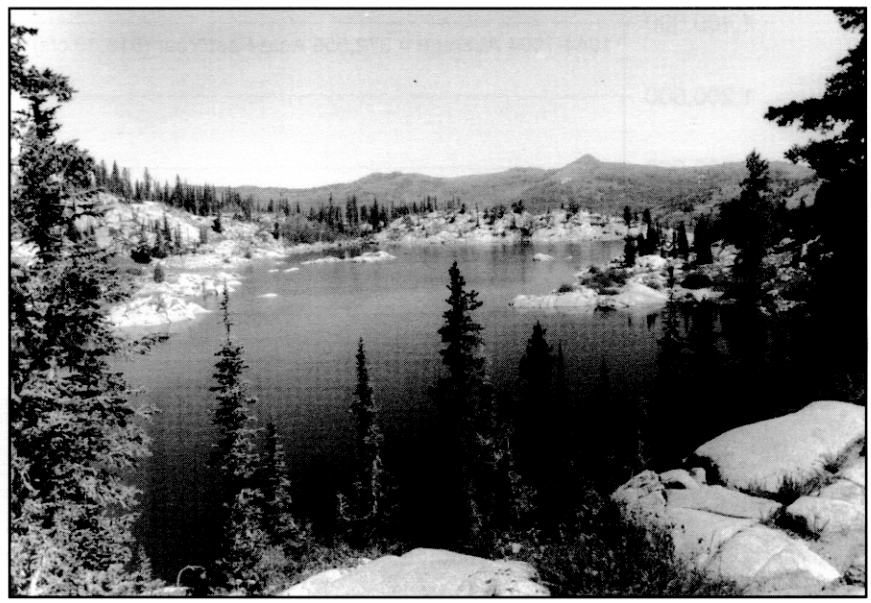
The 1995 total potable water use is 308,300 acre-feet while the 1995 total non-potable use is 244,200 acre-feet. The estimated total water use for the Jordan River Basin presently is 552,500 acre-feet per year. Compared with the present water supply, this leaves an unused supply of 92,450 acre-feet per year.

5.4.1 Municipal and Industrial Use

Municipal and industrial uses include all potable water along with non-potable water used in secondary irrigation systems. Total M&I water use for 1995 is 331,500 acre-feet, including 308,300 acre-feet of potable use and 23,200 acre-feet of non-potable secondary use. See Table 5-7. The majority of M&I water use is the treated water supplied by public water systems. This water is used for residential, commercial, institutional and industrial purposes.

Residential use of water includes drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, watering lawns and gardens, and other household uses. The Wasatch Front Water Demand/Supply Model (WFCM) estimated the 1995 residential water use at 164,600 acre-feet.

Commercial use includes water used in business facilities such as hotels, motels, restaurants, office buildings, retail stores and service stations. Institutional uses include water used in government and military facilities, prisons, educational facilities, golf course and park watering, fire-fighting, and unmetered losses within water delivery systems. The WFCM estimated the 1995 commercial/institutional water use to be 77,200 acre-feet. Industrial use includes water to manufacture products such as steel, petroleum, chemicals, paper or dairy products. Mining and other related activities are included in the industrial use category. The WFCM estimated the



Lake Mary

Table 5-7
WATER USE vs SUPPLY (1995)
Jordan River Basin

	Present Use (acre-feet/year)	Present Supply* (acre-feet/year)	Unused Supply
Potable			
Public water system:			
Residential	164,600	-	-
Commercial/institutional	77,200	-	-
Industrial	15,400	-	-
Subtotal	257,200	328,410	75,950
Private domestic systems:	24,600	24,600	-
Self-supplied industrial	26,500	26,500	-
Subtotal	51,100	51,100	
Total potable	308,300	384,250	75,950
Non-Potable			
Secondary			
Residential	10,000	10,000	
Self-supplied industrial	13,200	13,200	-
Agricultural	126,500	143,000	16,500
Developed wetlands	94,500	94,500	-
Total non-potable	244,200	260,700	-
Total water	552,500	644,950	92,450

* Reliable supply for nine out of 10 years

1995 industrial use supplied by public water systems at 15,400 acre-feet.

Approximately 90,000 people within the basin are not supplied by a public water system. An estimated 24,600 acre-feet of water is pumped by individual wells and used in private domestic systems. Self-supplied industrial water use, from data supplied by the Division of Water Rights, is an estimated 39,700 acre-feet. Of that amount, 26,500 acre-feet is groundwater, 3,200 acre-feet is non-potable surface and spring water, and 10,000 acre-feet is water from Tooele County

Secondary water systems can reduce the demand for treated water by providing lower quality water for such uses as watering lawns and gardens and other outside uses. At the present time, there are few secondary water systems in the Jordan River Basin. Draper and South Jordan secondary irrigation systems are the most significant in size, although other small secondary systems are in Riverton, Bluffdale and West Jordan. Annual secondary water use is estimated at 10,000 acre-feet per year.

Reducing the demand for culinary water by retrofitting existing subdivisions with secondary water systems has potential. Studies indicate, however, that constructing a secondary system for existing urban subdivisions would be very expensive. Retrofitting existing subdivisions with a secondary system would cost as much or more than the savings associated with reduced water treatment. Information on conserving water through secondary water systems is in Section 17, Water Conservation/ Education.

5.4.2 Agricultural

The land use mapping by the Division of Water Resources in 1994 indicates the present active irrigated lands include about 25,300 acres. The irrigated cropland consists of about 27 percent alfalfa, 36 percent pasture/grass hay land, 16 percent grain and corn, and less than 2 percent orchard and vegetables. The balance is idle and fallow ground.

The total agricultural water supply for an average year is estimated to be 143,000 acre-feet. Only about 126,500 acre-feet was diverted in 1995. About 3,000 acre-feet of that amount is supplied from groundwater.

5.4.3 Wetland and Riparian Use

Water-related land-use data developed by the Division of Water Resources indicates there are about 43,100 acres of wet meadows, marsh lands and open water areas on the valley floor. Most of these wetlands are situated along the shoreline of the Great Salt Lake. They are developed and managed by either public agencies or private entities (duck clubs) to enhance wildlife habitat. The net evapotranspiration from these developed wetland areas is estimated to be 94,500 acre-feet per year. The water supply comes through a number of well-established water rights, primarily surface water flows directly from the Jordan River.

5.4.4 Instream Flow Requirements

Maintaining a minimum flow in a stream for fishery habitat has not been historically acknowledged as a beneficial use of the state's water resources. In recent years, however, it has not only gained acceptance but it can now be established under legislative authority. No minimum instream flows are required for the Jordan River or its tributaries. Although releases to satisfy down stream rights, return irrigation flows and unused agricultural water flows make it doubtful any instream flow requirements will be needed for the Jordan River, the *Salt Lake City Watershed Management Plan* does recommend instream flow requirements be established for Wasatch Range mountain streams to preserve aesthetic and ecological values. See Section 6, Management.

5.4.6 Hydropower

The use of water to generate hydropower is a non-consumptive use that can also be relatively non-polluting. Because the amount of hydropower that can be developed is a function of the change in elevation, hydropower facilities are usually associated with dams or other diversion structures and often result in the de-watering of a section of a stream. Utah Power generates power from facilities on Big Cottonwood Creek while Murray City generates power from a hydro-power plant on Little Cottonwood Creek. The Federal Energy Regulatory Commission (FERC) issues licenses for hydropower projects. Licensees are required to mitigate impacts to fish and wildlife resources. This often involves an obligation to maintain a minimum flow in the portion of the stream below the diversion. See Section 18 for more information. ■